3647 0011

NESTABLE LOAD SUPPORT

Description

The invention concerns a nestable load support, also referred to as a pallet, comprising a deck, a peripheral outer edge and several legs, wherein each leg is formed by a respective depression in the deck and has two side walls and a bottom, wherein the side walls and the leg define a trapezoidal cross-section, and each with at least one opening in the side walls of the legs for the prongs of a stacker.

The terms "load support" and "pallet" are used synonymously in the present invention. Conventional nestable load supports have various disadvantages in daily use. Since the flexural strength of the load support is exclusively determined by the deck, the load support is either very heavy and requires a great deal of space, or the flexural strength is insufficient. When the stacker only partially underruns and lifts only part of the load support, the load support may break-off and damage the goods thereon.

DE 2 216 631 or EP 1 323 636 A1 disclose e.g. a pallet with several legs on each side of the pallet which have a trapezoidal cross-section. The outer edge and the deck are connected to each other via reinforcing ribs in the regions of an outer edge of the pallet which does not have legs.

In the pallets disclosed in DE 2 043 832 A, DE 1 456 707 A, DE 94 06 395 U and WO 93/00474, the deck extends on two sides of the pallet up to its outer edge.

During use, pallets are often subject to very rough handling by the fork-lift truck, with the frame of the fork-lift truck striking the outer edge of the pallet. This can introduce large forces into the pallet structure and can destroy the pallet.

It is the underlying purpose of the invention to provide a nestable load support whose loading capacity, in particular its flexural strength, meets the highest requirements. At the same time, the carrier support should also have a high breaking strength in response to rough handling and be produced with low material and production costs.

This object is achieved with a deck, a peripheral outer edge and several legs, wherein each leg is formed by one depression in the deck and having two side walls and one bottom, wherein the side walls and the leg define a trapezoidal cross-section, the side walls of the legs each having at least one opening for a prong of a stacker, wherein the outer edge and the deck are only connected to each other via the side walls and the bottoms of the legs.

Advantages of the invention

The inventive pallet has very high flexural strength with respect to the loading forces of the goods on the pallet, which act on the pallet. This flexural strength is independent of direction due to the surface resistance moment of the inventive pallet, which is constant about the periphery of the pallet. For this reason, the inventive pallet can be lifted from all sides by a fork-lift truck or be inserted and disposed in an elevated storage shelf or the like.

Moreover, the inventive pallet is very flexible in response to lateral forces, i.e. forces which are introduced e.g. by the frame of a fork-lift truck while

advancing the prongs into the inventive pallet. For this reason, the edge of the inventive pallet can bend in response to the frame of a fork-lift truck acting in the direction of the deck to thereby distribute the momentum introduced by the fork-lift truck into the pallet over a long path. For this reason, the material stress produced in the pallet is very small, even under such dynamic load conditions.

Even if an unloaded inventive pallet falls off a truck or a loading ramp, the inventive structure of the pallet accepts a sufficient amount of energy through elastic deformation that the pallet is not damaged. This permits use of relative brittle materials e.g. recycled plastic material, without any disadvantageous effects on the breaking strength of the inventive pallet.

The openings in the legs allow the inventive load support to be underrun and lifted with the prongs of a stacker. At the same time, the legs assume the function of a runner in the region of the openings to also ensure the required flexural strength at these locations. The legs may be sufficiently large or long to permit sufficient flexural strength of the inventive load support without any negative consequences for the handling of the inventive load support. The openings in at least one side wall of a leg permit movement of the load supports in the conventional manner using stackers or the like.

Since the legs have a trapezoidal cross-section, the inventive load support can be easily nested. Moreover, the openings in the side walls of the legs can be produced using a shaping tool, without a slider. This considerably reduces the tool costs and also increases the ejection rate of the inventive load supports from the shaping tool. This saves considerable production costs for the inventive load support compared to conventional load supports.

If plastic pallets are conventionally produced in tools comprising sliders, the ejection rate of this shaping tool is limited by the long travelling paths of the slider.

In a further embodiment of the inventive load support, the legs extend substantially over the entire length of the deck, thereby forming a runner. In this manner, the advantages of a load support having a runner with regard to loading capacity and flexural strength can also be fully realized with the inventive embodiment of the legs.

In order to further stabilize the inventive load support, several legs or runners may form a square or rectangle. These closed rectangles permit uniform loading of the load support in all directions. It is thereby distinguished from conventional Euro pallets of wood with e.g. three runners disposed parallel to each other, which have a greater flexural strength in the direction of the longitudinal axis of the runners than in a direction perpendicular to the longitudinal axis of the runners.

Optimum solidity and flexural strength of the inventive load support is obtained when the section edges between the side walls of the legs and the deck extend parallel to the outer edges of the deck, as claimed in a further advantageous embodiment.

The inventive load support may have a rectangular or square base surface, in particular a base surface with dimensions corresponding to the dimensions set in accordance with relevant industrial standards, such that the inventive load support is compatible with other standardized load supports.

The deck and/or the runners may be reinforced by several ribs to further strengthen the inventive load support.

In a particularly advantageous manner, the load support is produced from a plastic material, in particular, from recycled plastic material, such that it can be produced fully automatically with constant, maximum quality and at the same time low raw material costs.

In a further advantageous embodiment of the invention, the opening is wider than the prong of a fork of a fork-lift truck or elevating truck, and the opening is higher than the fork of a fork-lift truck or elevating truck, such that a fork-lift truck or elevating truck can enter the opening and lift the load support using at least one prong of the fork.

In further variants of the invention, two parallel openings are provided to permit lifting of the inventive load support from all sides by a fork-lift truck or elevating truck. Two prongs of the fork of a fork-lift truck or elevating truck can be inserted into the two parallel openings of the load support. This improves the tilt resistance of the load support in the lifted state.

In further embodiments of the invention, the separation between the center axes of the openings is between 340 mm and 400 mm, in particular 370 mm, and/or the height of the openings is greater than 85 mm, and the width of the openings is greater than 160 mm. In this manner, the inventive load support can be lifted, transported and disposed with conventional lifting trucks.

As a further supplement to the invention, the dimensions of the openings correspond to the standardized dimensions of transport pallets, such that the inventive load supports can be disposed into and transported in trucks, containers or other transport means without any compatibility problems.

Drawing

Further advantages and advantageous embodiments of the invention are shown in the following drawing, the description thereof and the claims. All features described in the drawing, the description thereof and the claims may be essential to the invention either individually or collectively in arbitrary combination.

Fig. 1 shows a top view of a first embodiment of an inventive load support;

Figs. 2 and 3 each show a section view of the first embodiment;

Fig. 4 shows a side view of the inventive load support according to Fig. 1;

Fig. 5 shows a section view of several stacked inventive load supports of Fig. 1;

Fig. 6 shows a view from below of the first embodiment of an inventive load support;

Fig. 7 shows a top view of a second embodiment of an inventive load support;

Figs. 8 and 9 each show a section view of the second embodiment;

Fig. 10 shows a side view of the inventive load support according to Fig. 7,

Fig. 11 shows a side view of several nested inventive load supports according to Fig. 7; and

Fig. 12 shows a view from below of the second embodiment of the inventive load support.

Description of the embodiments

Fig. 1 shows a first embodiment of an inventive load support 1 from above. Figs. 2 and 3 show sections along the lines A-A and B-B (Fig. 1) of the first embodiment. The inventive load support 1 comprises many identical components such as e.g. the legs 5. Not all components in the figures are provided with reference numerals, for reasons of clarity.

The essential features of the inventive load support 1 are explained below with reference to Figs. 2 and 3.

The inventive load support 1 consists of a deck 3 on which several legs 5 are formed. As is clearly shown in Fig. 2 (section A-A), the legs 5 have a trapezoidal cross-section. The trapezoidal cross-section of the legs 5 is formed by the side walls 7 and a bottom 8, wherein the side walls extend from the deck 3 to a lower edge 17. For reasons of clarity, not all side walls 7 and bottoms 8 are designated with reference numerals.

As can be gathered from the top view of Fig. 1, four legs 5 combine to form a square. The legs 5 extending in the direct vicinity of and parallel to the outer edges 9 of the load support 1 thereby form a large square having an edge length which is nearly equal to the outer dimensions of the load support 1. Since the side walls 7 of the legs 5 which are disposed at right angles with respect to each other, have the same cross-sectional profile and the same dimensions, they meet at the diagonals 11 of the

load carrier 1. For this reason, only two parallel side walls 7 are required to form a leg 5 in the present embodiment.

If, in other embodiments not shown in Fig. 1, the legs 5 do not meet at an angle of 90° at their ends, further side walls must be provided at these leg 5 ends, which preferably also extend conically towards each other.

A further leg 5 which consists of four side walls 7 is disposed in the center of the load support 1, which increases the seating surface of the inventive pallet.

The legs 5 extend from the deck 3 to a lower edge 17 of the load support 1, thereby considerably increasing the flexural strength of the load support 1.

In order to permit lifting and transport of the inventive load support 1 using conventional lifting trucks or fork-lift trucks, the side walls 7 have openings 19 with dimensions selected such that a prong of a fork-lift truck (not shown) can be inserted.

The section along line A-A (Fig. 2) clearly shows that all legs 5 have openings 19, such that the prong of a fork-lift truck can be completely inserted e.g. from the right hand to the left hand side into the load support 1, thereby lifting and moving the load support 1 using a fork-lift truck (not shown).

The thick arrows 21 in the top view show the directions in which the prongs (not shown) of a fork-lift truck can be inserted into and removed from the load support 1.

The sectional views along lines A-A and B-B (Figs. 2 and 3) clearly show the dimensions of the openings 19 and the separation between two parallel openings 19. It has proven to be advantageous if the width B of the openings 19 is larger than 160 mm and the height H of the openings 19 is larger than 85 mm. In this case, the conventional prongs of fork-lift trucks can be easily moved into the openings 19.

Figs. 1 through 3 also show that the deck 3 is reinforced by ribs 23. The legs 5 are also reinforced by ribs 25. The height of the ribs 25 can determine i.a. the depth with which a second load support 1 (not shown), which is disposed from above onto the load support 1 to be nested, is immersed into the lower load support 1.

It must be noted that the ribs 23 as well as the ribs 25 along the section edge A-A (Fig. 2) are only sufficiently high as to not impair free passage of one or more prongs of a fork-lift truck. In other words, the height H of the openings 19 must not be reduced by the ribs 23 and 25.

Fig. 2 also shows that the wall thickness of the side walls 7, the inclination of the side walls 7 and the height H of the openings 19 are matched in such a manner that the inventive load support 1 can be produced by a shaping tool which consists only of an upper part and a lower part, without a slider. This considerably reduces the production costs for both the tool and the inventive load support 1, since the cycle time for production of a load support 1 from plastic material, in particular, from recycled plastic material can be drastically reduced compared to that of a tool with slider.

Conventional plastic pallets require a slider which is inserted from the side into the shaping tool filling the space to be left free for the openings 19. It is straightforward that the tool costs would considerably rise with such a

long slider (not shown) moreover requiring a much larger press for producing the inventive load support 1.

Fig. 2, in connection with Fig. 1, show a further advantage of the inventive load support. Fig. 2 shows that the outer edge 9 and an edge 27 of the deck 3 are not directly connected, but indirectly via the side walls 7 and the bottom 8 of the leg 5. This permits deflection of the outer edge 27 in the direction towards the deck 3 in case a load acts from the side on the pallet as is indicated in Fig. 2 by arrow 29. A load of this type often occurs when the prongs (not shown) of a fork-lift truck are moved into the openings 19 and the frame (not shown) of the fork-lift truck hits the outer edge 9.

Since lateral forces are transmitted from the outer edge 27 to the deck 3 and about the entire periphery only via the side walls 7 and the bottoms 8, the breaking strength of the inventive pallet is secured on all sides and also on the corners.

Fig. 4 shows a side view of one inventive load support 1. This view clearly shows how the deck 3 is supported along its entire length by the peripheral leg 5 producing a load support 1 with great flexural strength. Since the openings 19 are disposed approximately in the region of the neutral section, i.e. in the center between the upper edge of the deck 3 and the lower edge 17 of the legs 5, they only minimally weaken the flexural strength of the load support 1. As a result, the legs 5 form a belt which extends below the openings 19 and thereby considerably contributes to the flexural strength of the inventive load support 1.

Fig. 5 shows a sectional view of three nested load supports 1. By nesting the load supports 1, the volume of several nested load supports 1 can be reduced to a fraction of the sum of the individual volumes. This

considerably reduces costs for transporting the inventive load supports 1 to their location of use. Fig. 5 moreover shows that the height of the ribs 23 and 25 also determines the depth of insertion of one load support 1 into another.

Fig. 6 shows the inventive load support 1 from below. This view shows the ribs 23 which reinforce the deck 3. The openings 19 are also shown. In order to avoid repetition and maintain the clarity of the drawing, not all of the components of Fig. 6 are provided with reference numerals.

Figs. 7 through 12 show a second embodiment of an inventive load support 1. It shares many of the features to the first embodiment and, to avoid repetition, reference is only made in the corresponding description of the figures to the essential differences explained below. For reasons of clarity, not all components in Figs. 7 through 12 have reference numerals.

The inventive load support 1 consists of a deck 3 on which several legs 5 are formed. As is clearly shown in Figs. 8 and 9, the legs 5 have a trapezoidal cross-section. The legs 5 are formed by side walls 7 and bottoms 8. For reasons of clarity, not all side walls 7 and not all bottoms 8 have reference numerals.

Four legs 5 are combined to form one square (Fig. 7). The legs 5 extending in the direct vicinity and parallel to the outer edges 9 of the load support 1 thereby form a large square whose edge length is almost equal to the outer dimensions of the load support 1.

Four further small squares are disposed inside the large square formed from four legs 5, the small squares also consisting of four legs 5 each extending at an angle of 90° relative to each other. In this arrangement of 5 x 4 legs 5 each being disposed in a square, two legs 5 always extend

parallel to each other, such that a section through the inventive load support produces a profile in the form of a "W". This "W" is shown in a simplified view in Fig. 7 and designated with reference numeral 13. Reference numeral 15 characterizes a dashed line along which the above-mentioned "W"-shaped cross-section of the load support 1 extends. Each of the other three small squares are formed by four legs 5 and also have this "W"-shaped cross-section.

This embodiment combines great flexural strength, great elasticity and large breaking strength with respect to lateral loads in the direction of arrow 29 (Fig. 9). For this reason, recycled plastic material may also be used without any disadvantages with regard to load resistance and service life of the pallet.

To permit lifting and transport of the inventive load support 1 using conventional lifting trucks or fork-lift trucks, the side walls 7 have openings 19 of dimensions selected such that a prong of a fork-lift truck (not shown) can be inserted.

The section along the line B-B (Fig. 9) clearly shows that all legs 5 have openings 19 such that the prong of a fork-lift truck can e.g. be completely inserted into the load support 1 from the right hand to the left hand side to permit lifting and moving of the load support 1 using a fork-lift truck (not shown).

The thick arrows 21 in the top view (Fig. 7) indicate the possible insertion and removal directions in which the prongs (not shown) of a fork-lift truck can be moved into and out of the load support 1. The inventive load support 1 is equally flexible and break-proof on all sides.

Figs. 7 through 9 also show that the deck 3 is reinforced by ribs 23. The legs 5 are also reinforced by ribs 25. The height of the ribs 25 can i.a. determine the depth of insertion of a second load support 1 (not shown), being disposed from above onto the load support 1 and nested into the lower load support 1.

It must be observed that the ribs 23 and the ribs 25 have a height along the section edge B-B (Fig. 9) that does not impair free passage of one or more prongs of a fork-lift truck. In other words, the height H of the openings 19 must not be reduced by the ribs 23 and 25.

The sectional view along line B-B also shows that the wall thickness of the side walls 7, the inclination of the side walls 7 and the level H of the openings 19 are matched in such a manner that the inventive load support 1 can be produced by a shaping tool which consists only of an upper part and a lower part, without a slider.

Fig. 10 shows a side view of one inventive load support 1 in accordance with the second embodiment. The side view corresponds to that of the first embodiment (Fig. 4) and reference is made to the statements in connection with Fig. 4.

Fig. 11 shows two nested load supports 1 in accordance with the second embodiment. It clearly shows that the volume of several nested load supports 1 can be reduced to a fraction of the sum of individual volumes due to nesting of the load supports 1. This considerably reduces costs for transporting the load supports 1 to their location of use.

Fig. 12 shows the inventive load support 1 from below and from the side. The view from below shows the ribs 23 which reinforce the deck 3. The openings 19 are also shown in this view.